

**REMARKS**

Upon entry of this amendment, claims 1 and newly submitted claims 11-12 are pending in the application. Claim 1 is an independent claim drawn to an apparatus for processing heavy hydrocarbon feed, and the newly submitted claims depend therefrom. Claim 1 has been amended to further clarify what the Applicant considers to be the invention and to clarify the distinctions between the inventive subject matter and the prior art references. Applicant further submits that the amendments to the claims do not add new matter within the meaning of 35 U.S.C. §132. The amendments to the claims have been made in order to advance prosecution of the application.

Claim 1 stands rejected as being obvious over van Dongen et al. (U.S. Patent No. 4,405,441) in view of van Klinken et al. (U.S. Patent No. 4,039,429) and Kwant et al. (U.S. Patent No. 4,200,519). Applicant submits that the amendments to claim 1 and the following remarks place the application in condition for allowance.

**Rejection of Claim 1 Under 35 U.S.C. 103(a)**

Claim 1 stands rejected under 35 U.S.C. 103(a) as being obvious over van Dongen et al. (U.S. Patent No. 4,405,441) in view of van Klinken et al. (U.S. Patent No. 4,039,429) and Kwant et al.

(U.S. Patent No. 4,200,519) for the reasons set forth in the Office Action.

### **RESPONSE**

Applicant respectfully traverses this rejection and requests reconsideration and withdrawal thereof.

The references of record, van Dongen et al., van Klinken et al. and Kwant et al. do not teach or suggest applicants' inventive subject matter as a whole, as recited in the amended claims. Further, there is no teaching or suggestion in the references which would lead the ordinary skilled artisan to modify them to derive the subject matter as defined in the amended claims.

The U.S. Supreme Court in *Graham v. John Deere Co.*, 148 U.S.P.Q. 459 (1966) held that non-obviousness was determined under § 103 by (1) determining the scope and content of the prior art; (2) ascertaining the differences between the prior art and the claims at issue; (3) resolving the level of ordinary skill in the art; and, (4) inquiring as to any objective evidence of nonobviousness.

To establish a *prima facie* case of obviousness, the Examiner must establish: (1) that some suggestion or motivation to modify the references exists; (2) a reasonable expectation of success; and (3) that the prior art references teach or suggest all the claim

limitations. Amgen, Inc. v. Chugai Pharm. Co., 18 USPQ2d 1016, 1023 (Fed. Cir. 1991); In re Fine, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988); In re Wilson, 165 USPQ 494, 496 (C.C.P.A. 1970).

A *prima facie* case of obviousness must also include a showing of the reasons why it would be obvious to modify the references to produce the present invention. See Ex parte Clapp, 277 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). The Examiner bears the initial burden to provide some convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings. Id. at 974.

#### **A. The Present Inventive Subject Matter**

As amended above, independent claim 1 is drawn to an apparatus for processing heavy hydrocarbon feed. The apparatus includes a heater for heating the heavy hydrocarbon feed, an atmospheric fractionating tower for fractionating the heated heavy hydrocarbon feed fed to the inlet of the atmospheric fractionating tower, thereby producing light atmospheric fractions and atmospheric bottoms, and a further heater for heating the atmospheric bottoms and producing heated atmospheric bottoms. The apparatus also includes a vacuum fractionating tower for fractionating the heated atmospheric bottoms and producing light vacuum fractions and vacuum residue, and a solvent deasphalting (SDA) unit for producing

deasphalted oil (DAO) and asphaltenes from the vacuum residue. The apparatus further includes a deasphalted oil thermal cracker for thermally cracking the deasphalted oil (DAO) and producing thermally cracked deasphalted oil, and a thermally cracked deasphalted oil connector connecting an outlet of the deasphalted oil thermal cracker to an inlet of the first fractionating tower by way of a line so that only the thermally cracked deasphalted oil is recycled to the inlet of the atmospheric fractionating tower by way of the line. The apparatus still further includes a light vacuum fraction thermal cracker for thermally cracking the light vacuum fractions for producing thermally cracked light vacuum fractions, a thermally cracked light vacuum fractions connector connecting an outlet of the light vacuum fraction thermal cracker to an inlet of the first fractionating tower by way of a line so that only the thermally cracked light vacuum fractions is recycled to the inlet of the atmospheric fractionating tower by way of the line. The first fractionating tower is the atmospheric fractionating tower.

Newly added claims 11-12 depend from claim 1 and add further limitations thereto. Since newly submitted claims 11 and 12 depend from claim 1 and necessarily contain all the limitations of claim 1, if claim 1 is not obvious over the prior art references, so too are the newly submitted claims not obvious over them.

**B. The Prior Art**

As has been previously stated in a prior response, Van Dongen (U.S. Patent No. 4,405,441) discloses a process for the preparation of hydrocarbon oil distillates. The distillates are prepared from asphaltene-rich feeds by a process comprising subjecting the feed to catalytic hydroconversion, and subjecting the distillation residue of the hydroconverted product to a combination of solvent deasphalting and thermal cracking.

In addition, van Klinken (U.S. Patent No. 4,039,429) discloses a combination of processes that are designed to convert atmospheric reduced crude to light products through conversion by Fluid Catalytic Cracking (FCC). Van Klinken discloses several combinations of vacuum distillation, visbreaking, deasphalting and FCC to obtain light products.

Further, Kwant et al. (U.S. Patent No. 4,200,519) discloses a process for the preparation of gas oil from residual oils by combination of two stages of thermal cracking, cyclone separation, vacuum distillation, deasphalting, atmospheric distillation, and recycling of certain streams.

**C. Differences between the Claimed Subject Matter**  
**and the Prior Art**

The differences between applicant's inventive subject matter and the cited reference are readily apparent from their independent and distinct disclosures. As is claimed in amended claim 1, the present inventive subject matter is directed to an apparatus that includes **a deasphalted oil thermal cracker, a light vacuum fractions thermal cracker, and recycle of the thermally cracked deasphalted oil and the thermally cracked light vacuum fractions.** The thermal cracking occurs with the **deasphalted oil and th light vacuum fractions,** thus resulting in the **absence of asphaltenes in the thermal crackers.** By this arrangement of the presently claimed apparatus, substantially all of the asphaltenes, both in the original feed and that which is produced by the thermal processes, is rejected in the asphaltene stream, **which is not fed to either thermal cracker.**

As can be seen, the present inventive subject matter removes essentially all of the asphaltenes before thermal cracking, thus removing the danger of coking the both of the thermal crackers feed streams. This is enhanced by the fact that the feeds entering both thermal crackers are first fed to the first atmospheric fractionating tower **and** then undergo solvent deasphalting prior to

being thermally cracked. The solvent deasphalting step removes the asphaltenes from the feed, leaving only the deasphalted oil, which is fed to the thermal cracker. This also allows for the complete use of the deasphalted oil. Likewise, only the light vacuum fractions are fed to the other thermal cracker. Furthermore, by applying a hydrogen donor stream or hydrotreated further portion of the further light vacuum stream to both the deasphalted oil thermal cracker and the light vacuum fractions thermal cracker, thermal cracking takes place in the presence of the hydrogen donor stream and the recycle of the thermally cracked products to the first fractionating tower occurs. The presence of the hydrogen donor stream aids in providing a higher quality and cleaner cracked product. Applicant submits that this is not shown in any of the cited references.

van Dongen et al. teach that only **some** of the cracked material is recycled. As is clearly seen in the van Dongen patent, the patent teaches **thermal cracking asphaltenes**. In particular, asphaltenes are present in stream 313 of Fig. 3, 404 of Fig. 4 and 530 of Fig. 5. These streams all lead to the thermal cracker in the respective apparatus depicted by the figure in question. As is stated above, the present claims are directed to an apparatus in which **no** asphaltenes are fed to either thermal cracker. Thus, the presently claimed apparatus is clearly different from the apparatus

in the van Dongen et al. patent.

Furthermore, the van Klinken et al. patent and van Dongen et al. patent also teach the cracking of asphaltenes. It can be clearly seen in van Klinken that the asphaltene containing residue of high pressure hydrotreating and distillation or deasphalting are subjected to cracking (see col. 3, lines 5-9 as well as the figures showing the bottoms of deasphalting unit 4 being fed to thermal cracker 5). Additionally, van Klinken et al. do not teach recycling the thermally cracked product to the atmospheric distillations column. Thus, as with the van Dongen et al. patent, the presently claimed apparatus is clearly different from the apparatus disclosed in the patent.

Likewise in the Kwant et al. patent, "an asphaltenes-containing hydrocarbon oil residue (7) obtained by atmospheric distillation is thermally cracked in zone (1)." Col. 4, ll. 7-8. This is also readily apparent from the figure in the patent. In addition and as with the van Klinken et al. patent, Kwant et al. fail to disclose recycling the thermally cracked product to the atmospheric distillation column. Again, this is different from the present claims, which explicitly exclude asphaltenes from the thermal crackers.

Since none of the references suggest or teach the above limitations, Applicant respectfully submits that the combination



thereof would also be deficient with respect to those limitations. Assuming, *arguendo*, that the references were combined in an attempt to achieve the presently claimed subject matter, Applicant respectfully submits that such a combination would still teach the thermal cracking of asphaltenes, which is contradictory to the claimed invention. Thus, the combination would fail to teach all claimed limitations, as is required in order to prove a *prima facie* case of obviousness. In particular, the combination of references would still lack the above limitation of thermally cracking asphaltene-free streams which, as explained above, is an important aspect of the present inventive subject matter.

To reiterate what is said above, the removal of essentially all of the asphaltenes before thermal cracking ensures removing the danger of coking in both of the thermal crackers feed streams. This is enhanced by the fact that the feeds entering both thermal crackers are first fed to the first atmospheric fractionating tower **and** then undergo solvent deasphalting prior to being thermally cracked. The solvent deasphalting step removes the asphaltenes from the feed, leaving only the deasphalted oil, which is fed to the thermal cracker.

Thus, Applicant respectfully submits that the Examiner has failed to prove a *prima facie* case of obviousness since the combination of references would fail to teach every claimed

limitation. As such, Applicant respectfully submits that the claims are not obvious over the references, and respectfully requests reconsideration and withdrawal of the rejection.

### CONCLUSION

In view of the foregoing, applicants respectfully request the Examiner to reconsider and withdraw the all pending rejections, and to allow all of the claims pending in this application.

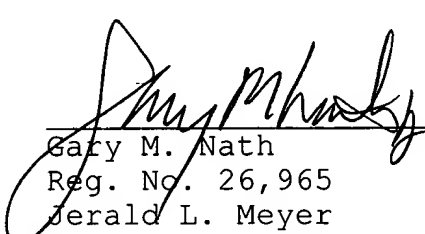
If the Examiner has any questions or comments regarding this matter, he is welcomed to contact the undersigned attorney at the below-listed number and address.

Respectfully submitted,

**NATH & ASSOCIATES**

Date: October 23, 2003

**NATH & ASSOCIATES**  
1030 Fifteenth Street, N.W.  
Sixth Floor  
Washington, D.C. 20005  
Tel: (202) 775-8383  
Fax: (202) 775-8396  
GMN:JLM:sv/rfr2.wpd

  
\_\_\_\_\_  
Gary M. Nath  
Reg. No. 26,965  
Gerald L. Meyer  
Reg. No. 41,194  
Customer No. 20529